SOIL SURVEY OF MESILLA VALLEY, NEW MEXICO-TEXAS.

By J. W. NELSON and L. C. HOLMES.

DESCRIPTION OF THE AREA.

The region traversed by the Rio Grande Del Norte in New Mexico and in the adjacent portions of Colorado and Texas consists of a series of structural valleys or basinlike depressions. These are filled to depths of several hundred feet by drifted deposits of sand, gravel, silt, and clay and are separated by mountain ranges or lower ridges. The southernmost of these basins, which lies in south-central New Mexico and extends for a short distance into Texas, is inclosed upon the east and west by high and rugged mountain ranges. The highest of these are the Organ Mountains upon the east, which attain an altitude of about 8,000 feet above sea level, 12 miles east of Las Cruces. This basin includes the Mesilla Valley, which forms the principal part of the area covered by this survey. This is one of the larger of the several later valleys of the Rio Grande that have been eroded in the unconsolidated deposits of the desert plains, partially filling the structural basins. In addition to the valley lands, there are also included within the survey narrow marginal areas of the adjacent upland, desert plains.

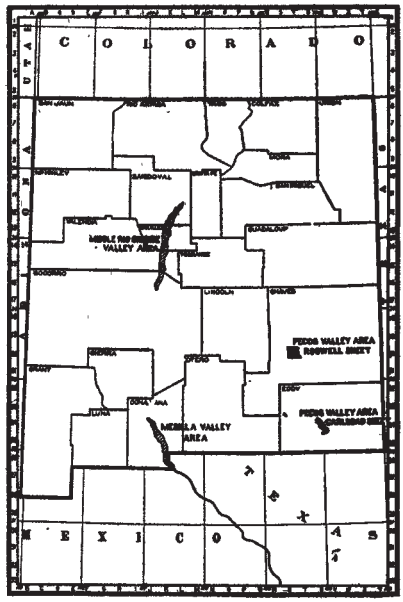


FIG. 54.—Sketch map showing areas surveyed in New Mexico.

The area extends from Selden, N. Mex., in a southeasterly direction to the termination of the valley at a point several miles north of El Paso, Tex., where the Rio Grande enters a narrow gorge several miles in length. It is included within the counties of Dona Ana,

N. Mex., and El Paso, Tex. It is about 55 miles long and varies in width from one-half mile to 5 miles, the average being about 2½ miles. It embraces 193 square miles, or 123,520 acres, about two-thirds of which lies on the east side of the river.

The desert plain bordering the valley upon the east is known as the Jornada del Muerto or "Journey of Death." This plain extends from the vicinity of Las Cruces northward beyond the limits of the area surveyed. Its altitude at its southern end is about 4,250 feet. The plain lying upon the west of the valley is similar in topography and origin to the Jornada Plain, having been separated from the latter by the comparatively recent eroded valley of the Rio Grande. The country is a nearly level plain, without dissecting streams, and extends southward into Mexico. This is known as La Mesa. East of the area, in the vicinity of Las Cruces, the Jornada Plain extends for a distance of about 10 miles to the foot of the Organ Mountains. This plain breaks into the valley with a slope of about 100 feet to the mile. As a rule the slope of La Mesa upon the west is of less uniform character. In the vicinity of the valley the material of the upland plains has in places been distributed by erosion, the soils of the plain passing gradually into the alluvial soils of the valley. The outer boundaries of the plains are, however, throughout the most of the area, marked by distinct and often high and precipitous bluffs or terraces. Erosion of the margin of the Jornada Plain has been particularly marked south of Selden. A number of small volcanic cones of recent origin occur on the plains on both sides of the valley. Lava from one of these has formed Black Mesa, a conspicuous table-land bordering the western side of the valley and extending from San Miguel northward a short distance above Santo Tomas.

The valley portion of the area lies from 100 to 300 feet below the surrounding plain. Extending along its east and west sides are slopes of the eroded and redeposited material of the adjacent plain from one-quarter mile to 2 miles wide. The elevation of the valley varies from 3,920 feet at Selden to 3,685 feet at its southern extremity, a difference of 235 feet throughout its length, or a fall of nearly 5 feet to the mile.

The Rio Grande is the only stream passing through the valley. During the dry season the channel of this stream is nearly or entirely dry. It is, however, subject to sudden floods of great magnitude, owing to the violent rainstorms occurring in the region drained by it. No tributaries of perennial flow enter the Rio Grande within the area, and very little drainage reaches the area from adjacent territory, the precipitation being absorbed by the porous deposits covering the upland plains. A few small arroyos enter the valley from both sides, serving as drainageways for the torrential rains falling on the

adjoining mesa slopes. The water and small quantity of sediment received from such sources quickly disappear in the valley below.

The valley has a nearly level east-and-west topography and slopes gently southward with the river. The drainage is in the direction of the stream and is usually good, except in local low-lying areas.

In the Mesilla Valley is some of the oldest agricultural land in the United States. It was occupied by the Spanish conquistadores under Cabeza de Vaca early in the sixteenth century, the invaders finding the region occupied by the Pueblo Indians, who had cultivated fields, irrigating the crops with water from the Rio Grande. Investigation has brought to light evidences of a still earlier occupancy by a more primitive people. The first permanent settlement took place at Dona Ana and dates from 1841, when land grants were made by the Mexican Government. Level portions of the valley lying west of the Rio Grande came into possession of the United States after the treaty with Mexico in 1848, but that portion lying east of the river did not become United States territory until 1853. This was soon followed by the advent of the first American settlers, protection from the Indians being afforded by United States Army posts at Fort Selden, Fort Filmore, and Mesilla. This latter place became the county seat of Dona Ana County and an important freighting point. Following the construction of the Atchison, Topeka & Santa Fe Railway, Las Cruces became the county seat of this county and the most important town in the valley.

During the early period of settlement stock raising was the principal industry. The population and development of the valley have shown a healthy, consistent growth throughout the past 20 years. Mexicans constitute a large majority of the population, but in recent years many Americans have settled in the valley, and with the completion of the Elephant Butte reservoir, now in process of construction by the Federal Government, many more will undoubtedly be attracted by the excellent climate and fertile soils of this region.

Many small towns are located within the valley. Most of the buildings are of the quaint architecture of Old Mexico, the houses being generally one-story adobe structures with flat roofs. In towns and villages they are built to the edge of the sidewalk, with a patio or courtyard in the center.

The principal towns of the valley from north to south are Dona Ana, Las Cruces, Mesilla, once the county seat of Dona Ana County and a famous station on the old Overland Trail; Mesilla Park, Santo Tomas, Bosque Seco, San Miguel, La Mesa, Chamberino, La Union, Berino, Anthony, Vinton, and Canutillo. All are old Mexican villages with the exception of Las Cruces and Mesilla Park. The former is rapidly developing into a modern city. It has a population

of 3,836. The New Mexican Agricultural College and Experiment Station is located at Mesilla Park.

The area is well supplied with schools, which are situated to meet the needs of the various communities.

A branch of the Atchison, Topeka & Santa Fe Railway traverses the valley and at Rincon connects with the main line of the Santa Fe Railroad, which extends from Albuquerque on the north to El Paso on the south. At El Paso the Santa Fe connects with the National Railways of Mexico and with the trunk line of the Southern Pacific. The El Paso & Northeastern, El Paso & Southwestern, and the Texas & Pacific also enter El Paso. All of these roads give good connections for outside points. The valley, therefore, has the northern and eastern markets for its early vegetables and markets as far south as central Mexico for its fruits and alfalfa.

The near-by mountains are rich in mineral wealth, and the mining camps offer a ready market for farm products at good prices.

CLIMATE.

The area is characterized by an arid climate. In summer the days and nights are clear, and but little inconvenience is experienced from oppressive heat. The average number of clear days in the year is 225 and the annual precipitation nearly 9 inches. Of this about 57 per cent falls during July, August, and September, 22 per cent during June, October, and November, and 21 per cent during the remainder of the year. Hail is practically unknown. In winter the days are pleasant, permitting all kinds of outdoor work, and the nights are cool and refreshing. Pulmonary and enteric disorders are infrequent and heat prostrations practically unknown.

The annual mean humidity is about 50, as compared with 29.7 at Independence, Cal.; 48.7 at Denver, Colo.; 50.2 at Carson City, Nev.; 52.8 at Salt Lake City, Utah; 71.7 at Los Angeles, Cal.; and 79.5 at Jacksonville, Fla. There is very little fog at any season of the year.

The prevailing direction of the high winds is from the west, occasionally shifting to the south, which if prolonged for two or three days bring settled rains. Thunderstorms usually come from the near-by mountain ranges. The high winds occur during the spring months. They are very disagreeable because of the great quantity of dust and sand which they carry. They also rob the soil of a great deal of moisture and injure tender crops planted on the sandy soils. The planting of windbreaks would do much to protect crops in such places. These winds occasionally reach a velocity of 60 miles an hour, but the average mean annual velocity is about 7 miles an hour. There is nearly always sufficient air movement to run windmills,

which are used quite extensively in pumping water for stock and for household purposes. The dry winds and arid climate cause excessive evaporation and loss of moisture from the soil. From a free water surface at the New Mexico Agricultural College at Mesilla Park the annual evaporation was found to be about 64 inches, while the evaporation from a similar surface at Fort Collins, Colo., is only 40.97 inches annually. This emphasizes the necessity of a liberal irrigation and constant cultivation of the soil to conserve moisture.

The average dates of the first killing frost in autumn, the last killing frost in the spring, and the earliest and latest recorded dates of killing frosts in autumn and spring at Mesilla Park as compared with similar data from other points in the West and Southwest are given in the following table, the data for the New Mexico points being supplied by the local office of the United States Weather Bureau at Santa Fe. Owing to the brief periods covered by continuous records and to local factors influencing the data at certain of the points, however, the results are not entirely conclusive and should probably be considered as only approximately correct.

Dates of killing frost.

Station.	Average date of last killing frost in spring.	Average date of first killing frost in fall.	Date of earliest killing frost in fall.	Date of last killing frost in spring.
Mesilla Park, N. Mex.	Apr. 17	Oct. 24	Oct. 10	May 22
Albuquerque, N. Mex.	Apr. 18	Oct. 19	Sept. 17	May 15
Phoenix, Ariz.	Feb. 23	Dec. 3	Nov. 9	Mar. 31
Montrose, Colo.	May 10	Sept. 29	Sept. 8	May 28

In the Mesilla Valley the hardy and late-blooming fruits are rarely injured by spring freezes, but the early-blossoming varieties, such as peaches, apricots, plums, and grapes, require smudging to insure profitable crops. The early-blooming varieties of fruit and sensitive truck crops are safer from frosts in spring on the mesa slopes than in the valley. The temperature over the valley soils is from 1 to 5 degrees colder than over the mesa slope soils in freezing weather. This difference is frequently sufficient to cause success or failure with the tenderer crops.

The following table gives the normal monthly and the mean maximum and minimum annual temperature, average yearly precipitation, with the total amounts for the driest and wettest years, the average snowfall, and the average wind velocity for the Mesilla Valley from records kept at Mesilla Park, N. Mex.

Statement of the salient features of the climate of Mesilla Valley.

Month.	Temperature.			Precipitation.				
	Mean.	Mean maximum.	Mean minimum.	Mean.	Total amount for driest year.	Total amount for wettest year.	Snow, average depth.	Average wind velocity per hour.
	F.	*F.*	*F.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Miles.*
December	42.5	55.0	23.7	0.44	0.73	0.81	1.0	5.6
January	42.2	56.6	23.2	.32	.08	1.01	.3	5.8
February	46.4	61.4	26.9	.50	.05	1.26	.3	7.2
March	53.5	66.9	32.8	.28	.26	2.03	.1	8.8
April	61.2	76.5	39.3	.17	.02	1.89	.1	8.7
May	70.3	82.8	46.9	.25	T.	.06	.....	8.0
June	78.9	95.2	56.4	.58	T.	.58	.....	7.0
July	80.8	96.0	62.5	1.84	.62	1.83	.....	6.4
August	79.4	92.4	61.2	1.71	2.06	1.58	.....	5.7
September	73.0	90.2	54.2	1.45	.18	3.08	.....	5.8
October	62.0	76.6	41.0	.76	.47	.83	.....	5.7
November	49.5	63.8	29.7	.57	.00	2.14	.6	5.5
Mean	61.6	76.1	41.4	8.82	4.47	17.10	2.4	6.7

AGRICULTURE.

The early settlers of the Mesilla Valley gave their attention principally to stock raising. Cattle, sheep, and goats were produced in large numbers, and only sufficient crops were grown to supply the local needs. The completion of the railroad through the valley in 1881 stimulated agriculture and caused wider diversification of crops and the extension of irrigation.

The diversion of much of the water of the Rio Grande for agricultural purposes in regions to the north and the uncertainty of a constant flow have prevented the development of nearly two-thirds of the Mesilla Valley pending the completion of the Elephant Butte reservoir. This project will furnish ample water for the entire valley and its rapid development will then be assured.

In 1910 about one-third of the land in the Mesilla Valley was under cultivation. About 65 per cent of this area was in alfalfa, 20 per cent in corn and Mexican beans (frijoles), 10 per cent in wheat, and 5 per cent in orchards, gardens, and vineyards. Additional small areas of land have been brought under cultivation in recent years with the installation of pumping plants in the valley. The wells are 30 to 65 feet deep and furnish a good supply of water. In many other instances pumped water is used to supplement the gravity supply when a shortage occurs in the river supply.

Little attention has been given to the rotation of crops, and the one-crop system has prevailed. Much of the farm work is done in a primitive manner and up-to-date machinery is used only by the

better class of farmers. Labor is generally plentiful, but is often unskilled.

The farms now average less than 50 acres in extent and are gradually decreasing in size, owing to more intensive methods of cultivation and the introduction of more profitable crops requiring greater care. Most of the farms are operated by the owners and very little leasing or renting is done.

Some sheep and goats are still raised in the valley, but the cattle industry has moved farther back to the mountains. Production of the general farm crops has dominated the agriculture of the valley to the present time. Land values, however, are rapidly approaching the limit of profit for such crops and more attention must of necessity be directed to specialized farming.

GENERAL FARM CROPS.

Alfalfa.—Alfalfa ranks first among the staple crops of the valley, about 65 per cent of the cultivated land being planted to this crop in 1910. It thrives on nearly all of the soil types of the area, but is best adapted to the Gila silt loam and clay. It does very well on the clay adobe, but is short lived and it is difficult to maintain satisfactory stands, because of the heavy, compact structures of this type. The puddling and contraction of the surface soil break the small roots and interfere with soil aeration. This type takes water slowly and in low-lying areas where water accumulates and stands for a few days the alfalfa is entirely killed out. The Brazito fine sand will produce good alfalfa if underlain by heavier material near the surface. The duration of a stand depends upon the soil type, the treatment given the crop, and the depth of underlying sand strata in the subsoil.

The average yield for this crop is about 3 tons per acre throughout the valley. This rather low yield is due to the attempt to grow the crop on some soils to which it is not adapted, to shortage of water at critical stages, and to inefficient methods of cultivation. The average yield could be doubled by attention to these details. Inoculation of the seed bed has not generally been found necessary. Alfalfa is a deep-rooted plant and leaves the land in excellent condition for succeeding crops. Land with 200 parts or more of white alkali per 100,000 of soil in the surface 6 feet should be avoided for this crop until reclaimed.

Most of the alfalfa is either baled in the field when cut, or stacked. The cost of baling is about $1.50 a ton. The hay is then stored in sheds or adobe barns until time for marketing. The average cost of caring for and baling an acre of alfalfa for one year of 3 cuttings is from $14 to $16. Baled alfalfa sells for about $12.50 a ton delivered at the railroad.

Very few fields have been properly leveled for this crop. It costs from $20 to $35 an acre to prepare fairly level mesquite and tornillo land for alfalfa, but with the more uneven areas and irregular, wind-blown areas the cost ranges from $50 to $60 an acre. On an average two irrigations of 3 inches each are required for each crop. Rather more is needed on stiff land and somewhat less on the types which absorb and hold the moisture well. Little attention has been given to seed production, but some seed of good quality is produced. The crop cures to a rich green color, has fine stems, and there is very little waste in feeding it.

Corn and wheat.—Corn and wheat are grown to a small extent, but are not profitable crops at the present price of land. Wheat yields from 20 to 35 bushels and corn from 15 to 20 bushels per acre. The low yield of corn is due in part to the poor varieties planted. The wheat is a soft variety and not the best for milling purposes. As these crops will continue to be grown in rotation for some time, it would be well to introduce more desirable varieties. Some corn, milo, and sorghum are grown without irrigation, but the yields are low and uncertain.

Irish potatoes.—Little or no success has thus far attended the growing of Irish potatoes. Many attempts have been made, but the best varieties soon deteriorate and in two or three years become worthless. The main cause for this appears to be the climate. The spring is late and cool and changes rapidly to very hot weather before the potatoes can mature. This differs from other warm climates where potatoes are grown, where the spring is warm enough and the warm weather of summer sufficiently delayed to give the tubers an opportunity to mature. Careful breeding and selection might develop a strain that would give better results, so that the home demands could be supplied.

Beans.—Excellent yields of beans are produced on the Gila fine sand, fine sandy loam, and silt loam and find a ready market at good prices. This has proved a profitable crop and is a valuable one to include in the rotations as it improves the soil.

Sugar beets.—Sugar beets of excellent quality have been grown in the area in a small way as feed for cattle. Lack of any market has prevented the growing of this crop on an extensive scale. The ruling high price of land makes it unlikely that the industry will be developed in the area.

RELATION OF SOILS TO TRUCKING.

Truck crops thrive generally over the valley, and with better markets many of these intensively cultivated should prove profitable. Some of the more important products will be considered in detail.

Melons and cantaloupes.—The fine sandy loam, silt loam, and fine sand of the Gila series, the Brazito fine sand, and the Anthony fine sandy loam and clay loam, in the order named, are the best soils for watermelons and muskmelons, and the silt loam, fine sandy loam, and light phases of the clay of the Gila series for cantaloupes.

From eight to nine irrigations are generally sufficient for melon culture, although the quantity of water applied each time and the frequency of applications depend upon the season and the moisture-retaining power of the various soils. Soils with heavy subsoils 3 to 4 feet below the surface and well tilled require less water than those where the subsoil is open to greater depths. The general appearance of the vines can usually be depended upon as a guide to irrigation. The quantity of water applied should be greatest at the time when the fruit is maturing.

With land in good condition and ready for irrigation it has been demonstrated that it costs from $15 to $25 an acre to produce watermelons and from $13 to $20 for cantaloupes.

The average yield of cantaloupes is from 12 to 18 to the hill. Forcing cantaloupes in greenhouses or cold frames has proved successful for the Mesilla Valley, as it enables growers to market the fruit from two to three weeks ahead of the regular season.

The Mammoth Ironclad, Gypsy, or Rattlesnake, Florida Favorite, Phinney's Early, and Cuban Queen varieties of watermelons appear best suited to the soils of the area. Of muskmelons the Emerald Gem, Montreal, Netted Gem, Netted Nutmeg, Cassaba, Osage, and Paul Rose give the best results, and of cantaloupes the Rocky Ford is best adapted to the soil types named above.

Onions.—One of the most remunerative of the special crops grown in the valley is onions, although to this time only a comparatively small acreage has been devoted to this crop. Where given good care excellent yields have resulted. The silt loam, fine sandy loam, and light phases of clay of the Gila series, and the Anthony fine sandy loam, clay loam, and gravelly sandy loam are well adapted to this crop. Gigantic, Gibraltar, and Brown Australian are the most desirable and profitable varieties to plant here.

For successful onion culture the soil must be well drained and free from alkali. The Mesilla Valley soils meet these conditions and this crop gives indications of becoming one of the leading industries of the area. Experiments conducted at the State Experiment Station show that it costs from $60 to $80 an acre to grow this crop in the valley. The yield of spring-planted onions is from 40,000 to 60,000 pounds per acre, and of transplanted onions from 70,000 to 90,000 pounds per acre. In car lots delivered in Chicago at average prices, from $200 to $300 net an acre has been realized here.

Cauliflower.—Cauliflower yields heavily, but is not in sufficient demand to justify a large acreage.

Sweet potatoes.—Sweet potatoes thrive on the fine sandy loam, fine sand, and light phases of silt loam of the Gila series and could be grown upon the Brazito fine sand. With the excellent demand for this vegetable in the Southwest it should develop into a very profitable crop.

Sweet corn.—Sweet corn does well on the fine sandy loam, silt loam, and light phases of the clay of the Gila series. Good yields are obtained.

Tomatoes.—Tomatoes yield heavily on all of the soils of the Gila series except the clay adobe and fine sand. The light soils produce early crops at a low cost, but the heavy types make up in increased yields. This industry was formerly of considerable importance in the valley, but declined as soon as canning facilities ceased. The great demand for fresh and canned goods in the Southwest offers an excellent outlet for both fresh and canned tomatoes at very satisfactory prices. Yields of 8 to 10 tons per acre are not unusual.

Chili peppers.—Chili is an important article of food in the Southwest, especially among Mexicans. It is eaten both green and matured, large quantities of the ripened fruit being preserved by drying and used in numerous ways in making sauces and seasoning for foods. Americans are developing a taste for it, and there is a growing demand for it each year. The Gila silt loam, fine sandy loam, and light phases of the clay are best adapted to this crop. Both ridge and level cultivation are used, with little difference in results. Most of the chili now grown is planted on ridges. This crop has a long bearing season and yields could be increased from one-third to one-half by transplanting from cold frames. The same cultural methods are used for this crop as for tomatoes. The plants should not be allowed to suffer for lack of water or the yields will be greatly reduced. Green chili is picked from 6 to 10 times and yields from 4,000 to 15,000 pounds per acre. Red or ripe chili is picked about twice. Red chili loses from 60 to 75 per cent in weight in drying. It makes heavy yields, depending upon the soil and the care given the crop. It sells in the retail market for 15 to 20 cents a pound. The common Mexican chili was the first variety grown in the area, but more desirable varieties, such as Chili Colorado and Chili Negro, are now receiving more attention.

Asparagus.—The soils best suited to asparagus growing in the area are the Gila clay, silt loam, fine sandy loam, and fine sand. The land should be well drained and free from alkali, although the presence of a small quantity of sodium chloride, or common salt, is not injurious. The fine sandy loam and fine sand are easily prepared and

produce an early crop, but the heavier types give larger yields. Their freedom from gravel makes the valley soils particularly desirable for the production of white or blanched asparagus. The subsoil for this crop should be heavier than a sand and lighter than a clay to insure best results. The fact that asparagus grows well in such large quantities along ditch banks and fences would indicate its adaptability to the soils of the valley. A few fields have been planted to this crop with good results.

FRUIT GROWING.

Apples.—Of the intensively cultivated crops of the area the apple is now receiving considerable attention. Early attempts to grow this fruit were unsuccessful, owing largely to the choosing of varieties unsuited to the local conditions, and many orchards have been replanted. Of the varieties tested so far the best results have been obtained with the Ben Davis, Gano, Jonathan, Black Arkansas, Mammoth Black Twig, Winesap, Missouri Pippin, and Rome Beauty, in the order named.

The well-drained silt loam, clay, and clay adobe of the Gila series and the Anthony clay loam, where free from alkali, are the best soils for apple culture in the Mesilla Valley. The hot summers of this region do not favor longevity of trees, and unless care is exercised in the selection of soils and varieties and in management apple orcharding is more or less hazardous. To assure the greatest success areas free from sandy strata to a depth of at least 2½ to 3 feet below the surface should be chosen. Poorly drained areas, in which accumulations of alkali salts may occur, should be avoided. The nearer the underlying sand strata are to the surface the shorter lived will be the orchard.

The basin method appears to be the most satisfactory plan for irrigating apple orchards in the area. From 24 to 30 inches of water applied in seven or eight irrigations has proved sufficient, though the quantity of water necessary varies somewhat with the different soil types and the character and position of the underlying strata to a depth of 6 or 8 feet. Young trees require less water but more frequent applications than bearing trees. Enough should be given, however, to encourage deep root development. Bearing trees are greatly helped by a moderate irrigation at the time of maturing a crop.

Cover crops, such as Canada field peas, vetch, soy beans, or clover, should be sown in the orchard each year from the 15th to the 25th of October and plowed under later to improve the physical condition of the soil. One deep plowing during winter and about five cultivations through the growing season are necessary for the best

results. Cultivation should begin about the 15th of May and end the first week in August. The late blooming of apple trees in the Mesilla Valley practically eliminates all danger from frosts.

In the Mesilla Valley the cost of bringing an acre of apples to the age of 6 years, or until the trees come into bearing, including land at $150 an acre and water right at 50 cents an acre, is about $350 to $400. Intertilled crops, such as corn, cantaloupes, tomatoes, chili, etc., grown among the trees, may be made practically to pay the expense of caring for the trees during this time.

The life of an apple orchard in the Mesilla Valley varies from 20 to 35 years, depending upon the variety, the type of soil, and the care given the trees. Missouri Pippin, Jonathan, and Winesap are somewhat shorter lived than other varieties recommended for the area. Codling moth, woolly aphis, and tree borers are the principal insect pests. The apples grown in the valley are in part shipped out by the growers and in part sold through the produce exchange at Las Cruces.

Peaches.—The completion of the Rio Grande irrigation project, with its added water supply, will undoubtedly provide a fresh stimulus to the growing of peaches, which heretofore have suffered from much the same conditions that made the first attempts at apple growing unsuccessful.

The fine sandy loam, silt loam, and fine sand of the Gila series, and the Brazito fine sand, in the order named, also the gravelly sandy loam, fine sandy loam, and clay loam of the Anthony series, where well drained and free from alkali, are the soils best adapted to peach culture. The Gila and Brazito fine sand should be underlain by a heavier material than a sand to insure the best results. The Anthony types are the best soils of the valley for peach culture, on account of their greater uniformity both in surface and subsoil features and because the danger of injury from spring freezes is less than upon the other types mentioned.

Late frosts in spring appear to be the controlling factor of peach culture in the area, and for this reason low-lying areas and depressions should be avoided. The temperature over the Anthony soils ranges from 1 to 5 degrees higher than over the valley in freezing weather. This difference is sufficient in many cases to insure crops without smudging. The humus content of the Anthony soils, however, is low and should be increased before any attempt is made to locate orchards upon them. This may be done most economically by plowing under leguminous crops or by applications of manure, where available, for a period of one to three years before setting out the trees.

The same care in the preparation of the soil and in cultural methods recommended for apple growing applies to peaches. Peach trees

have a somewhat smaller root and top development, however, and should be planted closer together. They require about the same quantity of water, or a little less, than apples. An abundant irrigation just before the ripening of the fruit has excellent results in greatly increasing the size and uniformity of the fruit.

The market requires red and yellow fleshed peaches, a fact which should be borne in mind in selecting stock. A few well-chosen varieties that ripen consecutively can be chosen. Shipments should be made in carload lots when possible. The shipping period for any one variety in the area ranges from 10 to 15 days.

Of the commercial varieties tested in the Mesilla Valley, the Early Alexander, Hynes Surprise, Mamie Ross, Elberta, Crothers, Columbia, and late Salway are the most desirable, in the order named.

The very latest ripening varieties are the last to blossom, the midseason to early fall varieties flowering first, while the earliest maturing varieties are medium to late in flowering. This is an important fact to be borne in mind by growers who have to contend with late spring frosts.

Peaches in the Mesilla Valley come into bearing in about three years, making the entire cost of an orchard somewhat less than for apples, which require about six years to fruit.

Young peach trees are more susceptible to freezes than mature trees and should be protected where necessary. The element of risk from frost would be greatly reduced in this industry if systematic smudging were provided for throughout the period of danger from late spring frosts.

Pears.—The acreage devoted to pears in the Mesilla Valley is being rapidly increased, and with the favorable climate and soil conditions of the valley pear culture should develop into one of the leading fruit industries of the area.

The clay adobe, clay, silt loam, and fine sandy loam of the Gila series, in the order named, and the Anthony clay loam, where well drained and free from alkali, are the soils best adapted to pear culture in the area. To secure the best results with this fruit the subsoil should be heavier than a sand to a depth of 4 feet, with a seam of clay adobe at 4 to 5 feet to aid in the retention of soil moisture in the root zone. Cultural methods recommended for apples apply equally to this crop. Pear trees spread less and may be planted much more closely than apples.

Trees of the old mission type on the soils of the area live for 75 to 100 years or more. Of the varieties tried in the valley, the Bartlett as a summer pear, Winter Nellis, Comice, and Kieffer are the best suited to local conditions and most profitable.

Pears bloom a little earlier than apples, but the blossoming period is late enough practically to eliminate danger from spring freezes.

Blight and other fungous diseases are not generally so troublesome here as in humid regions and are not a source of serious concern to orchardists.

Other fruits.—The soils and recommendations for peach culture are applicable to cherries. Sour cherries, such as the Montmorency and Early Richmond, are the varieties best suited to the Mesilla Valley. Of the two, the Montmorency is preferable, because it will remain on the trees from 20 to 30 days after ripening without deterioration, thus extending the period of harvest. Sour cherries are excellent for canning, and are profitable when sold as fresh fruit, bringing 5 cents a pound. The growing of sour cherries in Colorado has proved almost as profitable in many instances as the growing of the best varieties of other fruits, and they would undoubtedly prove equally profitable in the Mesilla Valley.

European varieties of plums are well suited to the silt loam and clay of the Gila series and the well-drained areas of Anthony clay loam where free from alkali. Caution should be exercised in planting Japanese and American varieties here on account of their early blooming and susceptibility to frosts.

Apricots thrive on well-drained and alkali-free areas of fine sandy loam and silt loam of the Gila series, but they bloom so early that great danger from freezing exists. The same soil preparation and cultural methods suggested for apples apply to apricots.

Strawberries, raspberries, currants, and gooseberries are well suited to the fine sandy loam, the light phases of the silt loam of the Gila series and the fine sandy loam and clay loam of the Anthony series.

Grape growing is carried on to some extent, but it is doubtful if climatic conditions are favorable for the development of the industry on a commercial scale. Forty or more varieties have been tried on the soils of the area, the most favorable of which are the Muscat, Mission, Black Cornichon, Black Fererra, and Flame Tokay. Layering or banking of the vines is frequently necessary to delay the growth in spring until danger from frost is past.

The silt loam, fine sandy loam, light phases of clay, and the fine sand of the Gila series are best suited to this crop. The fine sand should be underlain by material heavier than a sand at 8 to 10 inches for grape growing. On the heavy soils the growth of the vines is prolonged so late that they do not mature well before the autumn cold sets in, making the fruit late and poorly colored. Vines are set 8 feet apart without trellising. About 20 pounds of fresh fruit is the average yield per vine.

APICULTURE.

Beekeeping was introduced into the Mesilla Valley many years ago, and now ranks as an important industry. Fruit bloom, alfalfa, sunflowers, and mesquite blossoms are the chief sources of honey, that secured from mesquite flowers being considered one of the very choicest flavored on the market. Honey is sold both as extracted and in the comb. It finds a ready market. A normal hive averages from 35 to 50 pounds of honey a year. With the reduction in the size of farms in the area bee culture makes an excellent supplement to intensive farming. The climate of the valley is favorable for this industry and little trouble has as yet occurred from disease.

SOILS.

The soils of the Mesilla Valley lie almost entirely within the area covered by the recent or present flood plain of the Rio Grande, the only exception being a narrow margin of upland material forming the slopes of La Mesa and the Jornado del Muerto. The soils of the area thus fall in two distinct divisions, with by far the greater number in the alluvial section. Some of the material of the river flood plains has subsequent to its deposition been modified by eolian agencies and this has given rise to a distinct soil.

The deposits of the upland plains lying adjacent to the valley are mainly at least of stream-laid origin, having been placed in their present position by the Rio Grande or other streams during earlier periods. They are of Tertiary or Sedimentary age. Some of the deeper deposits of the plains may be of lake-laid origin, but this appears as yet uncertain and has but little bearing upon the character of the superficial soil material.

The most of the soil material of the plains bordering the present stream valley has subsequent to its original deposition been eroded and redistributed to some extent by surface flood waters or sheet erosion and by the waters of intermittent streams. Much of it occurs in the form of small alluvial fans along the immediate margin of the valley floor where intermittent streams enter the valley. The surface soil has in places been further modified by drifting.

The material is in places distinctly stratified; in other places it is composed of a heterogeneous mass of sand, gravel, silt, and clay. But little of such material is included within the area surveyed.

Along the western side of the valley the plains descend to the valley in an abrupt escarpment. But a very narrow margin of the plains material has here been included within the survey. Along the eastern side of the valley the slopes are more gentle and uniform, rising from the valley with a slope of about 100 to 200 feet to the

mile. This is due to the greater development of alluvial fans on this side of the valley, as a result of greater precipitation upon the slopes of the rugged mountains of the Organ Range and the minor ridges lying to the east. A somewhat wider marginal zone of the plains has here been included within the survey.

The surface material of the mesa slopes is very gravelly and sandy. The soils, which have been recognized under the Anthony series, are generally uniform, but local variations caused by the presence of wind-blown sand hummocks too small to map frequently occur. Pockets of gravel and sand frequently exist in the subsoil and underlying material. The sand consists of quartz, feldspar, limestone, and other rock particles. The gravel is mostly small and subangular. Stunted mesquite, chaparral, and other desert plants form the vegetation on the soils of this series. Three types are mapped, viz, the gravelly sandy loam, fine sandy loam, and clay loam. The soils are grayish brown to reddish brown, porous and well drained, but somewhat deficient in humus and of low moisture-retaining power. They usually lie above irrigation by gravity systems and have not been devoted to agriculture to any great extent.

The soils of the valley floor, as stated, consist of alluvial material laid down by the Rio Grande. Much of this has been transported long distances. Owing to the fact that no perennial streams enter the valley from the adjacent plains little material from this region is transported to the valley.

The gradient of the river through the area, which is a little less than 5 feet to the mile, is insufficient to enable the stream to carry its heavy load of fine sand, silt, and clay, and as a result the river channel is rapidly silted up. Accumulations of such deposits for a few years raise the bed of the stream to such an extent as to cause it to overflow its banks, widen its channel, or form an entirely new course. This sequence of events has been repeated many times and numerous old river channels may be traced through the valley.

Most of the material deposited by the river is fine sand, but the infrequency of large surface bodies of this material is due to the subsequent deposition of finer material when the flood waters begin to subside. The great mass of sediments constantly being brought down by the river and deposited over low areas and the heavy deposits of silt and clay from irrigation waters have given rise to a complexity of soils found in few other places in the United States. The sudden change in texture of the surface material within short distances and the great variation in the underlying strata make a physical classification very difficult. Six or more soil types are frequently encountered in a square mile, and five to six variations in texture are not uncommon in a 6-foot boring. In old river channels

and over low areas near them a white sand is frequently encountered near the surface. This sand is incoherent and porous and consists mainly of quartz. An area of sand may within 10 years become obscured by a deposit of heavier sediment from overflows or by deposition from irrigation water. From experiments conducted by the New Mexico Experiment Station at Mesilla Park it was found that 2 feet of irrigation water added to the land in one year will deposit about one-fourth inch of sediment. A much thicker deposit is laid down in low places along the river during overflows and in stream channels, and the deepening of the soil by annual deposition probably averages one-fourth inch over the entire valley. Deposits of 10 inches or more have frequently been made over extensive areas during a single period of overflow.

In many fields examined during the progress of the survey from 2 to 6 inches or more of clay were encountered, all of which had been deposited by irrigation water at the rate of one-quarter to 1 inch annually. Deposits of fine sediments from 1 foot to several feet in depth frequently occur along irrigation canals and laterals where water has been diverted to irrigate the land. These deposits sometimes form distinct slopes from the canals for a distance of 50 to 100 yards and in some instances the entire slope of the field has been changed.

In addition to surface deposits considerable material is carried by water and wind into cracks formed in the heavy soils during dry periods to a depth of a foot or more. These minor deposits have materially affected the physical properties of the underlying material in many places.

Alternating layers of fine sand, sand, and gravel in the subsoil and substrata of the valley soils, with a gradient in slope of the valley of nearly 5 feet to the mile, usually provide good drainage to the soils of the valley, except in local low-lying places where seepage has raised the water table. Such conditions occur locally over the entire valley, increasing in extent and frequency from Fort Filmore southward along the eastern side of the valley nearly to its southern extremity. In such places evaporation has caused the accumulation of alkali salts at the surface, making reclamation necessary before crops can be successfully grown.

The alluvial soils of the valley, exclusive of the material classed as Riverwash, have been classified as the Gila series, five types being differentiated. The soils of this series are reddish brown to grayish brown and underlain by stratified alluvial sediments, ranging in texture from sand to heavy clay.

The native vegetation consists of cottonwood, mesquite, tornillo, willow, arrowweed, and scattering growths of other kinds of brush, with the native grasses.

During periods of low water large quantities of fine sand are blown from exposed areas of the river bed, from recently formed beds or deposits of fine sand adjacent to the channel, and from the eroded beds of abandoned channels. In certain localities protected from the winds by willows or other vegetation or by topographic features the quantity of material removed in this manner is maintained at a minimum. In other places, where such protection is not afforded, wind-blown material has been transported for some distance and deposited over the adjacent alluvial soils of the valley. Some of the areas of wind-laid material are very small, while others are moderately extensive. The surface is normally of irregular contour and marked by small dunes, but in some of the areas covered it is generally level and the soil material is with difficulty differentiated in the field from that of the sandy material of the Gila series. The wind-laid material was recognized as the fine sand of the Brazito series. The soil and subsoil are similar in character and of gray, yellowish-gray, and grayish-brown color.

The soils of the area are characteristically calcareous. Laboratory examination of typical samples representing the various soil types in all cases indicates a high lime content, ranging from 0.88 per cent in the case of the Gila fine sand to 19.70 per cent in the case of the Anthony clay loam. In both the Anthony and the Gila series the greatest concentration occurs in the soils of heavier textures, the content decreasing with increase in size of the mineral particles. The average lime content of 19 samples representing all types, with the exception of the Brazito fine sand and Riverwash, is 7.68 per cent. The high lime content tends to improve the structural condition of the heavier types by rendering them more friable and of the porous sandy soils by making them more coherent. The occurrence of a liberal proportion of lime is, in the presence of organic matter, also conducive to the formation of humus and to the maintenance of good sanitary conditions in the soil.

Under favorable conditions of irrigation, drainage, and culture the soils of the area are productive.

The following table gives the names and extent of the several soils of the valley:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Gila silt loam	35,456	28.7	Brazito fine sand	3,968	3.2
Gila fine sandy loam	23,040	18.6	Anthony clay loam	576	.5
Gila clay	17,920	14.5	Gila fine sand	448	.4
Anthony gravelly sandy loam	17,088	13.8	Anthony fine sandy loam	64	.1
Gila clay adobe	16,960	13.7			
Riverwash	8,000	6.5	Total	123,520	.....

ANTHONY GRAVELLY SANDY LOAM.

The Anthony gravelly sandy loam consists of a light-brown or slightly reddish brown, medium to coarse textured sandy loam soil 6 feet or more in depth. The surface 2 to 3 inches has been moved about and modified to some extent by wind action and is bleached to a light brown or gray. The color beneath the surface is as already stated. The sifting out of fine material by the winds gives the surface a very sandy texture and causes a concentration of gravel. The quantity of such coarse material on the eroded slopes bordering the southern limits of the valley is often excessive, making the type here poorly suited for agriculture.

Where the gravel content is not so high the open structure and sandy nature of the soil make tillage easy, though in many places much leveling is necessary to prepare the land for irrigation. This is the case with badly dissected areas or steep slopes, which are best left uncultivated.

The Anthony gravelly sandy loam forms a narrow belt varying in width from one-quarter to 1 mile, lying on the slopes adjacent to the Mesilla Valley. On the west side the type occurs as a very narrow margin where the bluff of the upland descends to the valley. The type is most extensively developed on the slopes east of the valley, which rise more gradually and uniformly, with a gradient of 100 to 200 feet to the mile. The surface in many places is characterized by low wind-blown hummocks of sand, which support a growth of mesquite and are broken by occasional small arroyos. A relatively abrupt descent marks the boundary between this type and the soils of the Rio Grande flood plain.

The type Anthony gravelly sandy loam is open and porous and excessively drained, except in local areas along its lower boundary. The organic-matter content is low, and this in conjunction with the texture makes the type unretentive of moisture. The type is free from alkali, except in areas in which drainage is imperfect.

The material giving rise to this soil consists mainly of old river gravel, sand, silt, and clay laid down in earlier ages upon the Jornada del Muerto and La Mesa Plains and modified by subsequent erosion. The type lies above existing canals and has not been used for agriculture. Most of it will fall within the Government irrigation project and its development may be expected as soon as water becomes available.

The location of the soil on slopes gives good air drainage and a temperature during frosty nights from 1° to 5° higher than in the valley. At the time of fruit bloom this difference may be sufficient to save the crops from damage.

With ample water, good tillage, and the addition of liberal quantities of organic matter this type should develop into one of the very best peach, apricot, and sour-cherry soils of the area. It is also well adapted to the bush and vine fruits and early truck. The planting of fruit trees on this type should be delayed for two or three years after the first plowing to get the soil into a physical condition to support a thrifty growth of trees.

Roads are very sandy and heavy on this type and hauling is difficult. They may be greatly improved at little expense by surfacing with clay.

Land of this type without water rights sells for $40 to $100 an acre, depending upon its location.

The following table gives the results of a mechanical analysis of a fine-earth sample of the Anthony gravelly sandy loam:

Mechanical analysis of Anthony gravelly sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
500232	Soil	3.6	14.8	17.8	31.6	17.9	7.8	6.6

ANTHONY FINE SANDY LOAM.

The Anthony fine sandy loam consists of a uniform grayish-brown fine sandy loam, sometimes with a slight reddish tinge, extending to a depth of 6 feet or more. The soil contains but little organic matter. It has a smooth, open structure, is easily tilled, and is free from alkali. Only two bodies, each less than a square mile in extent, are mapped. They lie near the agricultural college, and are surrounded by the Anthony gravelly sandy loam.

The material giving rise to this type consists of fine material sorted out from the higher lying plain deposits and laid down in slight depressions or along arroyos on the lower part of the slope from the upland to the valley.

A stunted growth of scrubby mesquite and other characteristic desert vegetation is found on this type, none of which has been placed under cultivation because of the scarcity of water. Under irrigation, with good tillage, the application of manure, and green crops (preferably legumes) plowed under, the soil will be found well adapted to the growing of peaches, apricots, sour cherries, and early-maturing truck crops.

The following table gives the results of a mechanical analysis of a sample of the Anthony fine sandy loam:

Mechanical analysis of Anthony fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
500231	Soil	0.5	2.4	4.4	20.4	35.3	25.3	12.0

ANTHONY CLAY LOAM.

The surface soil of the Anthony clay loam consists of a light grayish brown clay loam, with a depth of 18 inches to 6 feet. The subsoil is a rather compact loam or clay loam, usually somewhat lighter in color than the surface soil, and extending to a depth of 6 feet or more. The surface soil is free from coarse material, except near bodies of the Anthony gravelly sandy loam, and is subject to little variation other than the occasional development of a fine sandy phase. It is friable under cultivation and easily tilled. In physical characteristics the type resembles a loam, but can be improved by the addition of organic matter.

The Anthony clay loam has a small extent. It occurs principally between Anthony and Canutillo, where it occupies slopes along the border of the valley. It lies a little lower than the Anthony gravelly sandy loam. The surface is favorable for irrigation by the furrow methods. Scrubby mesquite here and there, with heaps of windblown material, form the greatest irregularity of the surface. Small gullies and slight washes are not infrequent.

This type has been laid down over the Anthony gravelly sandy loam along the valley edge by the deposition of material by several intermittent streams issuing from the upland plains and slopes. The formation has been slow and irregular. The fine material composing it has been dropped by the shifting intermittent streams as they reach points of less declivity near the valley margin.

Nearly all of the Anthony clay loam carries alkali in injurious quantities. This condition has slowly resulted from the seepage and run-off from the high plains and slopes to the eastward, leaving small but continuous additions of alkali through evaporation. Under irrigation it should not be difficult to remove enough of the accumulated alkali to make the soil productive. The slope and drainage are sufficient to allow an escape of percolating waters into the subsurface drainage of the main valley.

When irrigation becomes possible and the alkali content is reduced in this manner, all of the crops adapted to the Gila silt loam can be profitably grown on this type. Of fruits, apples and pears will do best, the deep and uniform subsoil, as well as the comparative freedom of the type from frost, contributing to its value for these crops.

The type has not yet shown its possibilities under irrigation, but portions of it will no doubt receive water from the project now under construction. A reduction of the alkali and an increase in the content of organic matter should be the aim of the first cultural operations on this soil.

GILA FINE SAND.

The Gila fine sand is light-gray or grayish-brown uniform fine sand, 6 inches to 6 feet or more in depth. The subsoil material, when differing in character from the soil, consists of alternating lenses, pockets, or layers of alluvial sediments ranging in texture from coarse sand to silt and clay. These materials occur in irregular succession and may be encountered at any depth below 6 inches. The soil and subsoil contain much finely divided mica.

Small local bodies of medium to rather coarse textured sand are in places included within the areas of this type, as they are usually too small to be indicated upon a map of the scale used in this survey. Many areas of the Gila fine sand merge into areas of the Brazito fine sand, and in such cases the placing of boundaries is more or less arbitrary.

The Gila fine sand consists of recent alluvial sediments deposited by the Rio Grande. While large quantities of materials of this character and texture are deposited by the stream, over the larger proportion of the area so covered they have usually been so modified by the action of winds that they are mapped as a distinct soil of the Brazito series. The areas of Gila fine sand are inextensive and are practically confined to abandoned river channels or to areas of recent deposits occupying positions protected from the wind.

Areas of this soil vary somewhat in texture, owing to the intermingling under cultivation of different underlying materials. The type is low in humus and is deficient in power to hold moisture. It usually requires frequent irrigation, and where deep relatively large quantities of water. It demands only light farming equipment and is easily tilled. Its productiveness would be increased by the liberal use of barnyard manure or green manuring crops, preferably the legumes.

Little of the type is at present farmed, but with irrigation, drainage, and proper cultivation it should be well suited to the production of early truck crops. Where underlain by a subsoil of heavier texture, with the water table at sufficient depth, alfalfa, sour cherries, and peaches could probably be grown. If used for orcharding, the planting of cover crops, such as field peas, vetch, and other legumes to be utilized as green manure, would be advisable.

Under regular irrigation the type tends to assume a heavier texture, owing to the deposition and incorporation of fine sediments.

Such additions will in time modify the soil texture sufficiently to extend the range of crops to which it is suited.

In some lower lying bodies the water table lies near the surface and underdrainage is inadequate.

The following table shows the results of a mechanical analysis of a sample of the Gila fine sand:

Mechanical analysis of Gila fine sand.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
500227.....	Soil.....	0.0	1.4	12.2	69.0	11.5	3.3	2.1

GILA FINE SANDY LOAM.

The Gila fine sandy loam consists of a light-gray to brownish-gray fine sandy loam, ranging in depth from 6 inches to 6 feet. The subsoil, as in other types of the Gila series, is variable. The soil contains considerable organic matter, and has an open structure and smooth texture, making tillage easy. About half as much labor is required as on the clay adobe and clay types of the same series.

Irregular bodies of this soil occur throughout the entire valley, and it is one of the most extensive in the survey. It is most extensively developed along the river channel. The topography is nearly level to very gently undulating, though usually not quite so uniform as that of the heavier types. Water enters the soil readily, and the surface drainage is good. In areas occupying low positions, however, the water table lies near the surface, and evaporation of water brought to the surface by capillarity has caused some accumulation of alkali.

The material giving rise to the Gila fine sandy loam consists of alluvial sediments brought down from regions to the north and deposited over the valley during times of high water. Winds have also played some part in the formation of this type by drifting the fine sand and silt from the river bed during low water over the surface. New areas of this type are formed with each successive flood. Newly formed areas are frequently bare or nearly so. Willow quickly springs up on this type after its deposition, the growth of each year showing above that of the previous year.

The Gila fine sandy loam, like the silt loam, has a wide range in adaptation. In addition to being well adapted to alfalfa and other general farm crops, except the cereals, it is especially suited for the production of truck, peaches, pears, bush and vine fruits, sour cherries, plums, cantaloupes, and watermelons. The soil warms quickly in the spring, and if well tilled and handled will produce heavy yields of early maturing crops. Of the truck crops asparagus, tomatoes,

spinach, peas, sweet corn, lettuce, onions, turnips, peanuts, radishes, chili, beans, carrots, and sweet potatoes do especially well. Sugar beets also yield heavily. Some of these crops are now successfully grown and the others named only await established markets to place them among the leading crops of the valley. Vetch, soy beans, cowpeas, clover, and field peas serve especially well as catch crops and for green manure. For the successful growing of fruit and crops that occupy the ground for several years the subsoil of this type should be heavier than a sand to at least 3 feet. A stratum of clay at 4 to 6 feet will help to hold the moisture in the root zone. The texture of this type becomes heavier from constant irrigation by deposits of fine sediment on the surface, and to maintain an open friable condition these deposits should be thoroughly mixed with the underlying soil.

Only a small proportion of this type is under cultivation as yet, because of the limited water supply, the lack of markets for intensive crops, and the difficulty frequently encountered in clearing the land of willow and other brush.

Land values are generally lower for the Gila fine sandy loam than for the heavier soils, but as soon as more water becomes available and better markets are established it will rank among the choicest lands of the area.

The following table gives the average results of mechanical analyses of samples of this soil:

Mechanical analyses of Gila fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
500203, 500210	Soil	0.1	0.1	0.4	19.2	42.1	29.9	8.1

GILA SILT LOAM.

The Gila silt loam is a light-gray or brownish-gray, smooth-textured silt loam varying in depth from 6 inches to 6 feet. There is no definite line of division between the soil and subsoil, the entire mass consisting of interstratified beds of material varying in texture from clay to sand, with no regular order of succession. In some of the extensive bodies of this type occurring in the lower portion of the valley a relatively large quantity of very fine sand is mingled with the silt particles, giving the soil a floury structure. The soil has a tendency to granulate and is easily tilled. It is in places of rather heavy texture, approaching a silty clay loam. Thorough tillage with the addition of organic matter for a few years tends to darken the soil and to make it more suitable for plant growth by promoting granulation. In this way better aeration results and the power to hold moisture is increased.

The Gila silt loam occupies nearly level to gently undulating or sloping areas throughout the Mesilla Valley. It occurs more extensively in the southern than in the northern part of the valley. It lies along the river channel and below the irrigating canals. Much of the type is subject to great change each year, owing to the varying velocities and direction of the flood waters. New areas are formed by each inundation and old bodies are covered by material of differing texture and converted into other types.

The Gila silt loam consists of sediments brought from the north and laid down by the Rio Grande, during floods. None of the material is derived from local wash.

With the exception of some small areas, drainage over the type is good. Portions of the southern half of the valley, however, are at river level and are thus subjected to seepage and to a high water table. In such areas an accumulation of alkali has taken place. To overcome such conditions it will be necessary to lower the water table by providing drainage outlets. Other parts of the type in the lower part of the valley are swept by rapid currents during floods, and this prohibits their use for agriculture.

The number of crops suited to the Gila silt loam is greater than in case of the clay or clay adobe. Alfalfa, corn, chili, beans, sorghum; cantaloupes, onions, and other truck crops; peaches, pears, and apples can all be grown. The type is also well adapted to the growing of bush and vine fruits. With ample supplies of water for irrigation, freedom from alkali, and good management yields on this type are heavy. Little of it is under cultivation as yet, but its value has been demonstrated and shown to be one of the best soils in the valley for intensive agriculture.

Continual irrigation will make the texture of the soil heavier each year, and ultimately the deposits will necessitate another classification.

Land of this type sells for $50 to $175 an acre, depending upon its development and location.

The following table gives the average results of mechanical analyses of samples of the soil and a single analysis of the subsoil and lower subsoil of the Gila silt loam:

Mechanical analyses of Gila silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
500206, 500209.....	Soil.....	0.0	0.0	0.1	0.3	10.7	62.5	26.1
500207.....	Subsoil.....	.0	.1	.2	1.6	1.7	64.1	32.2
500208.....	Lower subsoil.	.0	.4	1.0	26.7	31.3	31.4	9.3

GILA CLAY.

The Gila clay consists of gray to grayish-brown clay, from 6 to 22 inches deep, underlain to a depth of 6 feet by irregularly stratified beds of sand, sandy loam, silt loam, and silty clay loam. The soil contains practically no material coarser than fine sand, but carries a relatively large quantity of silt, and some of the bodies approximate a silty clay loam in texture. While of heavy texture the physical composition of this type is such as to give it a slight tendency to granulation, and for a soil of its class it has a rather friable structure and under favorable conditions of moisture and tillage is readily maintained in good tilth.

The Gila clay is one of the most extensive and important types of the area. It occupies irregular areas throughout the valley, but decreases in extent as the southern end of the valley is approached. It frequently surrounds areas of clay adobe, and generally occupies a somewhat higher position than the latter. Considerable areas of the clay occur along the river channel, where the heavy growth of brush and trees checks the flow of flood waters sufficiently to cause the deposition of silt and clay particles. Narrow belts also occur in many places along the irrigation canals, where they have been deposited by irrigation. Such deposits are sometimes sufficient to form distinct slopes from irrigating ditches and heavy enough to cover and kill young alfalfa. This mantle of fine sediment deposited over the surface makes irrigation slow.

The surface drainage of the type is good, but in low-lying areas the water table is frequently near enough the surface to cause a rise of alkali. The greatest injury from alkali accumulation has occurred east of the Santa Fe Railway, between Fort Filmore and Anthony. Some of the affected areas in that locality are lower than the bed of the river. Such places have been protected from overflows by the dikes constructed by the railway company to prevent washing out of its track.

The material giving rise to the Gila clay has been transported as sediment from regions north of the valley. The soil is subject to modification during each succeeding flood by the deposition of different grades of material.

A scattered growth of tornillo, mesquite, arrowweed, and native grasses, with a heavy growth of willow and cottonwood, form the vegetation upon this type.

The Gila clay is adapted to the general farm crops. Alfalfa yields are heavier on this type than on the clay adobe, owing to more favorable conditions for obtaining uniform stands. Wheat yields from 20 to 35 bushels an acre and other crops do equally as well. Vegetables, among them chili peppers, asparagus, and tomatoes, are

successful. Sugar beets give good yields. Rhubarb and cantaloupes are among the products of the type. On selected areas apples, pears, and cherries succeed.

Deeper tillage, the application of stable manure, and the plowing under of leguminous crops will do much to improve the physical condition of the type.

Land of the Gila clay type where well located and planted in alfalfa is held at prices ranging from $125 to $200 an acre.

The following table shows the results of mechanical analyses of samples of the soil and subsoil of the Gila clay:

Mechanical analyses of Gila clay.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
00213	Soil	0.0	0.1	0.1	1.5	9.0	42.8	46.5
00214	Subsoil	.0	.0	.1	5.3	45.8	34.8	13.9

GILA CLAY ADOBE.

The Gila clay adobe consists of a grayish-brown to dark-brown, heavy, compact clay, varying in depth from 6 inches to 4 feet. The subsoil, extending to a depth of 6 feet or more, is composed of irregularly stratified material varying in texture from sand to silty clay loam. This sand, which is occasionally of the finer grades, is in places nearly white, clean river sand, and occurs in layers ranging from an inch to a foot or more in thickness. The surface soil is generally shallow, but occasionally it is several feet deep. In old river channels or near them the soil is frequently underlain by quartz sand near the surface. Such areas are poorly suited for the production of deep-rooted crops. The surface soil is usually very heavy and of a compact adobe structure, cracking when dry. The dense, compact structure makes tillage very difficult and seriously interferes with the downward passage of water. The areas of more uniform soil usually occur in nearly level areas somewhat removed from old stream courses. The proportional area of the type decreases toward the southern boundary of the area.

In places where irrigation has been practiced for many years the entire surface soil has been built up from sediments carried in the irrigation water. It is significant that the adobe type is most extensive in those localities which have been continuously irrigated for the longest time, and its formation may be in part due to this artificial factor. Exceptionally silty flows of water are sometimes used to

make "fills" in depressed areas or to add heavier material to local sandy areas. In some instances old river channels and other surface irregularities have been obliterated in this way and this has resulted in some of the deepest phases of the clay adobe type.

The underdrainage of this soil is good, and injury from alkali very rarely occurs. In irrigation the soil absorbs water very slowly and much is lost by surface evaporation. In low places where water is allowed to stand over the surface for some time alfalfa is drowned out, and considerable areas have been destroyed in this manner. To obviate this injury the land should be uniformly leveled and borders so constructed as to prevent water from accumulating at any one place. Deeper plowing and subsoiling where underlying sandy material is near the surface, the application of manure and coarse litter, and the growing of crops with finely divided root systems will do much to improve the texture and structure of this type.

The Gila clay adobe is one of the most extensive types of the area. It occurs as irregular bodies throughout the Mesilla Valley wherever conditions have favored the deposition of the finest sediment carried in suspension by the floods of the Rio Grande, as in depressions where the water was impounded or in level areas along the river banks. This is the last material laid down by the flowing water.

Alfalfa, apples, wheat, and corn are the main crops grown on this type. With good preparation of the soil and proper irrigation from 3 to 6 tons of alfalfa per acre are produced. Wheat yields from 20 to 35 bushels an acre. The average yield of alfalfa is low, however, on account of poor stands and irregular water supply. The soil is too heavy for truck crops. Wherever the surface material is uniform to 2½ feet or more and the underlying material is heavier than a sand to 3½ or 4 feet, apple culture is a success. Great care should be exercised in the selection of suitable areas of this type for fruit culture on account of its extreme variability. Depressions and old river channels should be avoided. Numerous borings to 6 feet or more should be made to determine accurately the condition in the subsoil. The more closely the sand approaches the surface the more irregular will be the life of the trees, with a corresponding uncertainty in the yields. In places of great irregularity in depth and surface features other crops would better be grown. The Ben Davis, Gano, Black Arkansas, Mammoth Black Twig, Missouri Pippin, Rome Beauty, and Winesap varieties of apples have proved the best suited for production in this area and on this type.

The application of stable manure or plowing under of green crops, preferably field peas, vetch, or clover, the year before planting fruit trees, is advisable. Old alfalfa fields well prepared are very good lands for orchard planting.

The physical properties of this soil make it valuable for pear culture, and the acreage planted to this fruit is steadily increasing. The Bartlett, Comice, and Kieffer are the varieties best adapted to local conditions. Land of this type of soil in good condition, well located and in alfalfa, sells for $125 to $200 an acre.

The following table gives the average results of mechanical analyses of samples of the soil and subsoil, and a single analysis of the lower subsoil of the Gila clay adobe:

Mechanical analyses of Gila clay adobe.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per ct.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
500204, 500218, 500224	Soil.....	0.1	0.0	0.1	1.0	1.9	26.8	70.1
500205, 500225.....	Subsoil.....	.1	.1	.4	9.9	18.3	51.3	19.9
500226.....	Lower subsoil.	.0	.4	6.5	74.6	11.6	4.2	2.4

BRAZITO FINE SAND.

The Brazito fine sand consists of a light-gray to grayish-brown fine sand. The material is usually micaceous, of uniform texture, and open, porous structure. The subsoil is similar in color, texture, and structure to the soil material and generally extends to the depth of 6 feet, although in the shallower areas of soil, stratified alluvial sediments of variable texture may occur at depths of less than 6 feet.

As mapped the area of the Brazito fine sand embraces some local undifferentiated bodies of fine sand of the Gila series, the two types merging in such a manner that separation is often impracticable.

The soil has been formed by the action of the winds on the alluvial material forming the Gila soils. During periods of low water in the Rio Grande large quantities of fine sand and very fine sand are blown from the river bed and spread over the adjoining land areas. This is subsequently drifted into dunes and much more extensive areas of the Brazito type would occur in the area were it not for the protection from winds afforded by heavy growths of willow and cottonwood along the river banks, which catch and hold the drifting sand.

Small depressions among dunes of this type generally consist of heavier soils covered by a few inches of fine sand, but over the deeper phases the soil material is quite uniform. The shallow bodies vary somewhat, being influenced to some extent by the intermingling of the heavier underlying soils. The type is low in organic matter.

The Brazito fine sand has a very uneven topography in most places and considerable leveling is necessary before it can be used for agri-

culture. The newly formed dunes are free from vegetation for a short time, but the older ones support a stunted growth of mesquite, sage, arrowweed, and native grasses.

Very little of this type is under cultivation, on account of the expense entailed in leveling it, which in some instances amounts to more than the original value of the land. When in condition for crops the type is well adapted to the growing of early truck, sweet potatoes, peanuts, and asparagus. Catch crops of vetch, field peas, and other legumes should be planted frequently to increase the supply of organic matter and to improve the physical condition of the soil. Alfalfa may also be grown on this soil where the sand is not too deep. The use of sediment-laden irrigation water from the Rio Grande on this type will in time make its texture much heavier, and greatly extend the range of crops which can be successfully grown upon it.

The porous character of this soil and the elevation at which it usually occurs make it normally free from alkali, even when located in sections of poor drainage. Low spots and interdune areas sometimes contain alkali, especially if the underlying soil carries an excess of these salts.

The soil has little value at present and is generally sold in conjunction with more desirable types.

RIVERWASH.

Riverwash occupies a continuous strip along the course of the Rio Grande throughout the valley. This strip varies in width from about 100 yards to nearly a mile. It is composed largely of yellowish or brownish gray fine sand, and is subject to continual variation by reworking and recovering at times of high water. At moderate stages of flow the river usually occupies but a small part of this sandy belt. In late summer the entire area may be dry. It is either water-logged or excessively drained, depending upon the supply of flowing and percolating waters seeking lower levels along its extent. The surface is level and bare of vegetation. Danger from overflow and erosion during the growing season makes the type nonagricultural under present conditions. The low banks along the margin of the type are constantly being encroached upon, while accompanying deposition occurs at other places. Embankments to control the floods are expensive, difficult to maintain, and if successful only serve to intensify the damage at some other point. It is believed that the contemplated storage of flood waters and the equalizing of the river's flow consequent upon the Government project now under construction will permit the reclamation of a great deal of the Riverwash, as well as relieve the low-lying areas along its border. In

this case the land will be adapted to the same crops as the lighter phases of the Gila fine sandy loam and fine sand, and the recommendations for handling those soils will be applicable to it.

ALKALI.

Alkali is found in small bodies throughout the Mesilla Valley area, but the accumulations have little bearing upon agriculture, except in the lower half of the valley. The salts appear as a white incrustation in affected areas and are always accompanied by a high water table and poor drainage. Such areas are indicated upon the soil map by appropriate symbols.

The alkali areas of the Mesilla Valley have been caused by evaporation at the surface of ground water brought from below by capillary attraction. Evaporation is very rapid in the valley and a considerable concentration of salts may take place during relatively short periods, even where soil solutions are extremely dilute.

Most of the alkali of the area has its origin in the waters of the Rio Grande and the seepage waters from the adjoining high plains. These waters are known to carry noticeable quantities of alkali salts, especially at certain periods of the year. They work their way through the soil, and where conditions become favorable rise to the surface, depositing the salts as they evaporate. The irrigation water at certain periods of the year is known to carry as much as 40 or more parts of soluble salts per 100,000. No injury can possibly result from the use of such water on the land, except where it is allowed to accumulate as seepage in depressions. With 2½ feet of water of the above concentration added annually it would require more than 15 years to add 0.2 per cent of alkali to the surface 4 feet of soil if none of this water escaped in the underground drainage. Such conditions seldom, if ever, exist in the Mesilla Valley, and the above concentration of the river water only occurs for short periods during the summer months.

The great danger from alkali accumulations in the valley occurs in the low-lying areas. The added salts of irrigation water have practically no effect on such areas, however; but it is the continual deposition of minute quantities from evaporating subsoil waters that causes the trouble. Overirrigation on higher lying areas and leaky canals contribute to the danger of the rise of alkali in these areas. Anything that tends to bring the water table within capillary distance at the surface aids the accumulation of the salts.

The alkali salts most commonly found in the valley are sodium sulphate, sodium chloride, magnesium sulphate, magnesium chloride, and potassium sulphate. The composition of the alkali varies in dif-

ferent locations, as will be seen from results in the following table giving analyses made by the experiment station at Mesilla Park:

Alkali determinations of three samples collected at different places in Mesilla Valley.[1]

Sample No.	Constituent.							
	K_2O.	[2]Na_2O.	Lime (CaO).	MgO.	Al_2O_3.	SO_3.	Cl.	CO_2.
1	4.71	37.72	5.57	0.98	3.24	10.16	47.96	Trace.
2	3.57	28.97	6.60	1.55	.00	47.72	4.58	Trace.
3	.21	31.38	7.92	1.05	.00	52.67	1.20	Trace.

[1] Bul. 22, Alkali in the Rio Grande and Animas Valleys, New Mexico Agr. Expt. Sta.
[2] Determined by difference.

The quantity of alkali sufficient to injure plants in the Mesilla Valley depends upon the kind of salts present, the variety of crop, and the type of soil in which the alkali occurs. With general farm crops on the heavier textured soils the maximum limit is about 200 parts of alkali per 100,000 of dry soil, not including sodium chloride or black alkali. Crops on sandy soils show the same injury as on the heavy types with 100 parts per 100,000. Sodium chloride and sodium carbonate (black alkali) are much more injurious than the other salts. Black alkali, however, is not present in any appreciable quantities in the area, owing to the presence of gypsum in the soil and river water.

The only practicable method of reclaiming alkali lands in the Mesilla Valley is by lowering the water table over affected areas and washing the excess of salts into the country drainage by flooding. In places where the underlying material is porous simply lowering the water table and flooding will suffice, but if the subsoil is heavy to considerable depths the laying of tile drains may be necessary.

Of the crops that may be grown in places where the soils are charged with alkali or where reclamation is in progress, sugar beets, hairy vetch, sweet clover, and oats are important on account of their tolerance of white alkali. Asparagus will endure moderate quantities of sodium chloride. Sunflowers, tussock grass, salt grass, and canaigre will endure from 200 to 1,000 parts of alkali per 100,000. Apples, pears, and quinces will withstand 100 parts of white alkali per 100,000 without serious injury. Peaches, apricots, plums, corn, rhubarb, mustard, kale, and rape are quite sensitive and should not be planted upon alkali soils. Potatoes, carrots, and turnips are watery if produced on alkali soils and lose their keeping qualities. Alfalfa is rather sensitive when young, but when well established is fairly resistent. The clovers, peas, and shallow-rooted crops are sensitive and should not be planted until reclamation is well advanced.

The well waters of the valley and adjoining mesa slopes can be used for drinking and culinary purposes.

IRRIGATION.

Irrigation in various forms was an important feature in the early agriculture of the Mesilla Valley. All traces of this early irrigation, however, have been obliterated by heavy depositions of sediment from the waters of the Rio Grande.

The chief source of water for irrigation in the Mesilla Valley is the Rio Grande. Irrigation is supplemented to some extent by the 9 inches of annual rainfall, most of which occurs during the summer months. A moderate amount of water for irrigation is also obtained by pumping from shallow wells, ranging from 40 to 65 feet. These tap a good supply of water.

The water developed to this time has been inadequate for the irrigation of the fertile soils of the valley, but the Federal Government has undertaken the Rio Grande irrigation project, which, when completed, will furnish ample water for the whole valley.

The character of the Rio Grande water is such as to make it suitable for irrigation at all times where drainage is good. From tests made in the Mesilla Valley by the experiment station at Mesilla Park over a period of five months it was found that the quantity of alkali carried by the river water varied in ratio from 1 to 7, i. e., by using the water of the river for irrigation at certain periods seven times more alkali would be added to the land than if used at certain other times. This is due to the fact that large quantities of alkali are brought to the surface by evaporation during dry periods in the drainage basin to the north, the heavy rains which follow removing much of the salts before they can be returned to the soil. It was also observed that waters from certain tributaries bring down much more alkali than others. During flood periods in summer, when the river water is a light brick red color, it was found to contain about 42 parts of salts per 100,000. Of the tributaries of the Rio Grande the Rio Puerco is known to be quite saline, but the flood waters from other tributaries seldom if ever carry as much as 20 parts salts in 100,000.

There are 11 community canals now in operation in the Mesilla Valley, which carry all of the water now available. A noticeable feature of these canals is their heavy silting from the great quantity of sediment carried by the water. Successive accumulations of such deposits have built the canals up until they are now several feet above the surrounding country in many places. The main canals and large laterals are cleaned once each year and many of the field ditches and small laterals several times a year.

The border method of applying water is most commonly used, but the check and furrow methods and flooding are employed to some

extent. The borders run with the lay of the land and water is added from a small lateral at the highest point. Considerable leveling is required over most of the valley to prepare the land for irrigation, and this important matter has received too little attention in the past for the best results. Improper leveling of the land has left low places in many fields upon which the irrigation water stands. Alfalfa is injured or killed in such places.

Little attention has been given to the duty of water in the valley. Overapplication is the present tendency. This has done much to impair the physical condition of the soil and to increase the danger from the accumulation of alkali in low places. The experiment station and leading farmers of the valley have demonstrated that from 26 to 30 inches of water are sufficient for general farm crops and fruit, and less is required for the short-season crops. Uneven fields, with poorly prepared seed beds, shallow tillage, insufficient cultivation, and a low organic-matter content may, however, require nearly twice this quantity of water to mature a crop. The aim should be to add just enough water to wet the soil to the depth of the most effective root development, which in this valley is 4 feet or less, depending upon the crop grown.

SUMMARY.

The Mesilla Valley is located along the Rio Grande in the south-central part of New Mexico, and extending for a short distance into Texas. It represents the largest subdivision of the Rio Grande irrigation project and embraces an area of 193 square miles, or 123,520 acres. The survey comprises the alluvial lands of the valley, with a small area of the bordering plains. The average elevation of the valley is 3,800 feet above sea level.

The annual rainfall is 8.82 inches, most of which falls during the summer months. High winds, carrying dust and light soil, prevail during the spring months. The summers are long, the days hot, and the nights pleasant. There is little inconvenience from cold during the winter months.

Nearly one-third of the area is under cultivation, and agriculture is making rapid progress. Alfalfa, wheat, corn, oats, sugar beets, asparagus, bush and vine fruits, and truck crops thrive. Dairying, beekeeping, and poultry raising are also growing industries.

Water for irrigation is secured from the Rio Grande and to a limited extent from wells.

Alkali is present in many small spots throughout the valley, but has little influence on crop production except in the southern part of the valley.

Labor is plentiful, but often unskilled. There is little renting of farm lands in the valley, most of the farms being worked by the owners.

Including Riverwash ten soil types were identified and mapped in the survey of the area. These have been classified under the Anthony, Gila, and Brazito series. Of the first series there are three members, viz, a gravelly sandy loam, a fine sandy loam, and a clay loam. The Gila series is represented by the fine sand, fine sandy loam, silt loam, clay, and clay adobe types; the Brazito series by a single type, the fine sand.

The heavier soils are used mainly for the production of general farm crops and apples. The lighter types are best adapted to the stone fruits and truck crops. The soils for the most part are very productive, and are kept so by sediments laid down annually by irrigation waters and the floods of the Rio Grande.

The clay adobe of the Gila series is an extensive type of the area. It responds readily to careful treatment and yields good crops of alfalfa, wheat, oats, apples, and pears. The clay of this series has also a fairly extensive development and is best suited to the general farm crops and to apples, pears, and heavy or late truck crops. Small areas of alkali occur throughout the type. Deeper plowing and the incorporation of organic matter are the principal steps needing present attention on this soil.

The Gila silt loam occurs most extensively in the southern half of the area. Alkali in quantities sufficient to injure crops is found in spots throughout the type. It has much the same adaptations as the clay of the series. The fine sandy loam is a more friable soil and is somewhat better suited to truck crops, stone fruits, and small fruits. The fine sand member of the series occurs only in small areas and is not of much present agricultural importance. It is best adapted to early truck crops and, when well drained, to stone fruits.

But little of the Brazito fine sand is farmed. The surface is frequently hummocky and with difficulty prepared for irrigation. When supplied with water early truck crops can be grown, and where the subsoil is sufficiently heavy, peaches and sour cherries.

The Anthony gravelly sandy loam occurs upon the marginal valley slopes. This type is usually free from alkali. None of it is under cultivation.

The Anthony fine sandy loam occurs in only two small bodies near the agricultural college. It is well drained, free from alkali, and well adapted to peaches, sour cherries, bush and vine fruits, and truck crops.

Only two small bodies of the Anthony clay loam are found. These lie in the southern part of the area. The type has a good slope, but carries some alkali. When well drained it is adapted to fruits, general farm crops, and truck.

Riverwash occurs quite extensively in the wide, flat river channel. It is nonagricultural land.

NRCS Accessibility Statement

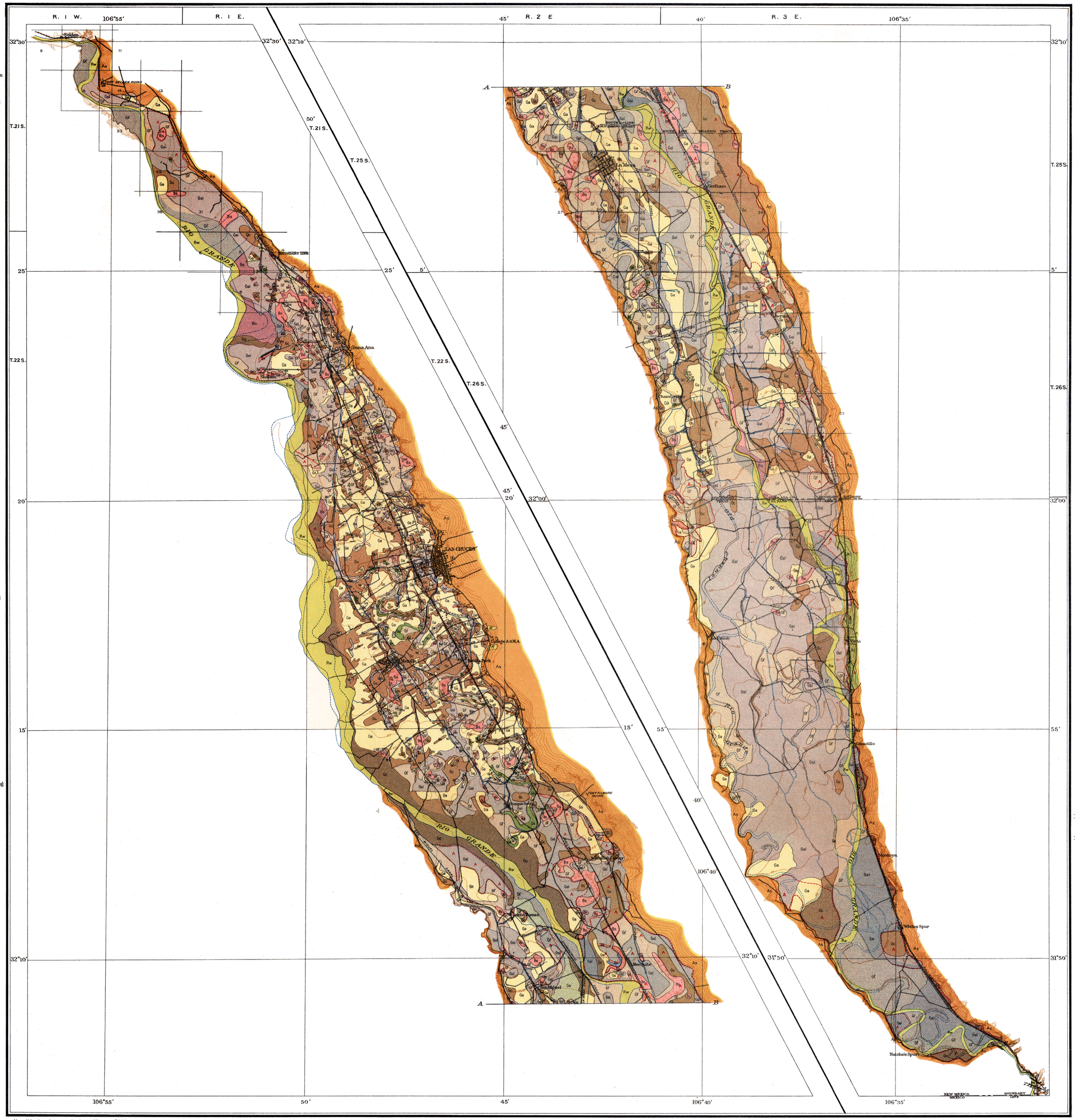
This document is not accessible by screen-reader software. The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at 1-800-457-3642 or by e-mail at ServiceDesk-FTC@ftc.usda.gov. For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at http://offices.sc.egov.usda.gov/locator/app.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

U S DEPT OF AGRICULTURE
BUREAU OF SOILS
MILTON WHITNEY, CHIEF
CURTIS F. MARBUT, IN CHARGE SOIL SURVEY

SOIL MAP
NEW MEXICO – TEXAS
MESILLA VALLEY SHEET

NEW MEXICO AGRICULTURAL EXPERIMENT STATION
LUTHER FOSTER, DIRECTOR, REX E. WILLARD, SOIL PHYSICIST.



SOIL PROFILE
(6 feet deep)

- Anthony gravelly sandy loam — Grsl
- Anthony fine sandy loam — Fsl
- Anthony clay loam — Cl / L
- Gila fine sand — Fs / Ms
- Gila fine sandy loam — Fsl / Ms
- Gila silt loam — Sil / Ms
- Gila clay — C / Ms
- Gila clay adobe — Cad / Ms
- Brazito fine sand — Fs

LEGEND

Sil	Silt loam
Cl	Clay loam
C	Clay
L	Loam
Fs	Fine sand
Fsl	Fine sandy loam
Grsl	Gravelly sandy loam
Cad	Clay adobe
Ms	Mixed sediments ranging from sand to clay

LEGEND

- Anthony gravelly sandy loam — As
- Anthony fine sandy loam — Af
- Anthony clay loam — Al
- Gila fine sand — Gs
- Gila fine sandy loam — Gf
- Gila silt loam — Gsl
- Gila clay — Gc
- Gila clay adobe — Ga
- Brazito fine sand — Bs
- Riverwash — Rw
- Alkali areas — A
- Overflow areas
- RIO GRANDE
  - Present Channel
  - Old Channel

Macy H. Lapham, Inspector in charge Western Division
Soils surveyed by J.W. Nelson and L.C. Holmes,

BASE MAP FROM
U.S. RECLAMATION SERVICE SHEETS

Scale 1/63360

1 inch = 1 mile
Contour interval 5 feet.

JULIUS BIEN CO. N.Y.

Field Operations
Bureau of Soils
1912